What is claimed is:

1. A method for losslessly embedding a message into a digital object comprised of samples, said method comprising the steps of:

extracting from said object a first subset that is losslessly compressible;

said first subset having the property that it can be randomized while preserving the perceptual quality of said object;

compressing said first subset into a compressed bitstream;

concatenating said compressed bitstream with said message to form a second subset;

inserting said second subset into said object in place of said first subset to form a transformed object, whereby said message is effectively transmitted and extracted by transmitting said transformed object and extracting said second subset therefrom; and

restoring said object by decompressing said compressed bitstream, restoring said first subset, and reinserting said first subset into said object.

2. The method of claim 1, wherein said digital object is an uncompressed image.

3. The method of claim 1, wherein said digital object is an image in a lossy image format.

4. The method of claim 1, wherein said digital object is an audio file or a video file.

5. The method of claim 1, wherein said first subset comprises all bits from a fixed bitplane.

6. The method of claim 1, wherein said first subset is generated by adding invertible noise (flipping) and applying special discrimination (prediction) functions to small groups of pixels in said digital object.

7. The method of claim 1, wherein said message is a digital watermark.

8. The method of claim 1, wherein said message is an authentication code.

9. A method for losslessly embedding a message into a digital object comprised of samples, each of said samples having an original value, said method comprising the steps of:

defining a first set S(x), whose values are equal to x, as a first subset of samples from said object;

defining a second set S(y), whose values are equal to y, as a second subset of samples from said object;

assigning a first value to x and a second value to y, wherein said values x and y are close together and said first and second subsets S(x) and S(y) differ substantially in size;

scanning said object in a defined pattern, whereby members of S(x) and S(y) are losslessly compressed to form a bitstream;

concatenating said bitstream with said message and embedding a concatenation into a union of said first and second subsets S(x) and S(y) by scanning said object in said defined pattern and choosing said first value to embed an x and said second value to embed a y, whereby said message is effectively transmitted and extracted by transmitting said concatenation and extracting said second message therefrom; and

restoring said object by decompressing said concatenation, scanning said object in said defined pattern, and restoring said original values in said object.

10. The method of claim 9, wherein said digital object is a palette image, an uncompressed image, an audio file, or a video file.

11.The method of claim 9, wherein said digital object is a watermark.

12. The method of claim 9, wherein said digital object is an authentication code.

13. Apparatus for losslessly embedding a message into a digital object comprised of samples, said apparatus comprising:

means for extracting from said object a first subset that is losslessly compressible;

said first subset having the property that it can be randomized while preserving the perceptual quality of said object;

means for compressing said first subset into a compressed bitstream;

means for concatenating said compressed bitstream with said message to form a second subset;

means for inserting said second subset into said object in place of said first subset to form a transformed object, whereby said message is effectively transmitted and extracted by transmitting said transformed object and extracting said second subset therefrom; and

means for restoring said object by (1) decompressing said compressed bitstream, (2) restoring said first subset, and (3) reinserting said first subset into said object.

14. Apparatus as in claim 13, wherein said digital object is an uncompressed image.

15. Apparatus as in claim 13, wherein said digital object is an image in a lossy image format.

16. Apparatus as in claim 13, wherein said digital object is an audio file or a video file.

17. Apparatus as in claim 13, wherein said first subset comprises all bits from a fixed bitplane.

18. Apparatus as in claim 13, wherein said first subset is generated by adding invertible noise (flipping) and applying special discrimination (prediction) functions to small groups of pixels in said digital object.

19. Apparatus as in claim 13, wherein said message is a digital watermark.

20. Apparatus as in claim 13, wherein said message is an authentication code.

21. Apparatus for losslessly embedding a message into a digital object comprised of samples, each of said samples having an original value, said apparatus comprising:

means for defining a first set S(x), whose values are equal to x, as a first subset of samples from said object;

means for defining a second set S(y), whose values are equal to y, as a second subset of samples from said object;

means for assigning a first value to x and a second value to y, wherein said values x and y are close together and said first and second subsets S(x) and S(y) differ substantially in size;

means for scanning said object in a defined pattern, whereby members of S(x) and S(y) are losslessly compressed to form a bitstream;Apparatus for losslessly embedding a message into a digital object comprised of samples, each of said samples having an original value, said apparatus comprising:

means for defining a first set S(x), whose values are equal to x, as a first subset of samples from said object;

means for defining a second set S(y), whose values are equal to y, as a second subset of samples from said object;

means for assigning a first value to x and a second value to y, wherein said values x and y are close together and said first and second subsets S(x) and S(y) differ substantially in size;

means for scanning said object in a defined pattern, whereby members of S(x) and S(y) are losslessly compressed to form a bitstream;

means for concatenating said bitstream with said message and embedding a concatenation into a union of said first and second subsets S(x) and S(y) by scanning said object in said defined pattern and choosing said first value to embed an x and said second value to embed a y, whereby said message is effectively transmitted and extracted by transmitting said concatenation and extracting said second message therefrom; and

means for restoring said object by (1) decompressing said concatenation, (2) scanning said object in said defined pattern, and (3) restoring said original values in said object.

means for concatenating said bitstream with said message and embedding a concatenation into a union of said first and second subsets S(x) and S(y) by scanning said object in said defined pattern and choosing said first value to embed an x and said second value to embed a y, whereby said message is effectively transmitted and extracted by transmitting said concatenation and extracting said second message therefrom; and

means for restoring said object by (1) decompressing said concatenation, (2) scanning said object in said defined pattern, and (3) restoring said original values in said object.

22. Apparatus as in claim 21, wherein said digital object is a palette image, an uncompressed image, an audio file, or a video file.

23. Apparatus as in claim 21, wherein said digital object is a watermark.

24. Apparatus as in claim 21, wherein said digital object is an authentication code.

25. A computer-readable storage medium embodying program instructions for a method for losslessly embedding a message into a digital object comprised of samples, said method comprising the steps of:

extracting from said object a first subset that is losslessly compressible;

said first subset having the property that it can be randomized while preserving the perceptual quality of said object;

compressing said first subset into a compressed bitstream;

concatenating said compressed bitstream with said message to form a second subset;

inserting said second subset into said object in place of said first subset to form a transformed object, whereby said message is effectively transmitted and extracted by transmitting said transformed object and extracting said second subset therefrom; and

restoring said object by decompressing said compressed bitstream, restoring said first subset, and reinserting said first subset into said object.

26. A computer-readable storage medium embodying program instructions for a method for losslessly embedding a message into a digital object comprised of samples, each of said samples having an original value, said method comprising the steps of:

defining a first set S(x), whose values are equal to x, as a first subset of samples from said object;

defining a second set S(y), whose values are equal to y, as a second subset of samples from said object;

assigning a first value to x and a second value to y, wherein said values x and y are close together and said first and second subsets S(x) and S(y) differ substantially in size;

scanning said object in a defined pattern, whereby members of S(x) and S(y) are losslessly compressed to form a bitstream;

concatenating said bitstream with said message and embedding a concatenation into a union of said first and second subsets S(x) and S(y) by scanning said object in said defined pattern and choosing said first value to embed an x and said second value to embed a y, whereby said message is effectively transmitted and extracted by transmitting said concatenation and extracting said second message therefrom; and

restoring said object by decompressing said concatenation, scanning said object in said defined pattern, and restoring said original values in said object.